EXHIBIT 24

REDACTED

IN THE UNITED STATES DISTRICT COURT
FOR THE EASTERN DISTRICT OF VIRGINIA
Alexandria Division

UNITED STATES, *et al.*, ***Plaintiffs*,** **- against -** **GOOGLE LLC,** ***Defendant.***	**Civil Action No. 1:23-cv-00108 (LMB/JFA)**

DECLARATION OF NIRMAL JAYARAM

I, Nirmal Jayaram, pursuant to 28 U.S.C. § 1746, hereby declare as follows:

1. I have worked for Google LLC ("Google") since 2012. Throughout that period, I have been a member of engineering teams developing Google products that allow advertisers to purchase display advertising, including Display & Video 360 ("DV360") and Google Ads.[1] I am currently a Senior Director of Engineering at Google, based in the company's office in Mountain View, California, and my current responsibilities include buy-side ads quality optimizations. Based on my personal experience with and knowledge of Google's products, I describe below the material features of those products and my understanding of how they generally functioned, though there may have been exceptions (e.g., bugs, experiments).

[1] DV360 used to be known as DoubleClick Bid Manager, but I refer to it as "DV360" throughout this declaration. Google Ads used to be known as AdWords, but I refer to it as Google Ads throughout this declaration.

Google Ads Bidding on AdX

2. Google Ads allows advertisers to place their ads on websites and apps that use AdX, as well as in other places.

3. Google Ads runs an internal auction-like process for display advertising. Google Ads advertisers specify the constraints (e.g., budget, targeting settings, frequency capping) on the ad impressions they would like to bid for and bids are only submitted for ad impressions that meet the constraints specified by the advertiser.

4. Google Ads advertisers choose to submit bids on a cost per click ("CPC"), cost per action ("CPA"), cost per 1000 (mille) active views ("CPMAV"), or cost per 1000 (mille) impressions ("CPM") basis. Sometimes advertisers use automated bidding products, where instead of providing bids directly, they provide goals (e.g., maximize conversions) and constraints (e.g., budget). Automated bidding systems translate these goals and constraints to an impression value (e.g., eCPM, or expected cost per 1000 impressions).

5. To determine which bid Google Ads will submit to AdX, Google computes the impression value for eligible ad candidates so that they can be compared in the same cost units. The Google Ads auction selects the highest-scoring ad (or set of ads, in the case of ad formats that allow for multiple ads to be shown). An ad's score is based on the advertiser-specified objectives and constraints (e.g., amount of the bid associated with the ad), as well as factors such as the ad's quality and relevance to the user.

6. Before 2021, Google Ads advertisers were charged the higher of (i) the bid they needed to beat bids from other Google Ads advertisers in the Google Ads auction, and (ii) the bid they needed to win the AdX auction, factoring in the Google Ads margin, with a cap to ensure that Google never charged an advertiser more than the advertiser's stated maximum willingness to pay.

At all times, Google Ads advertisers that bid on a CPC basis have been charged only when a user clicks on an ad.

7. Google Ads frequently submitted two "bids" to the AdX auction (when available) from the introduction of the AdX auction in 2008 until the move from a second-price to a first-price auction in September 2019: (1) the maximum bid amount on behalf of the relevant advertiser (referred to below as the "high bid") and (2) the minimum price that Google would pay if the high bid won the AdX auction (referred to below as the "low bid").

8. Before 2013, Google Ads would multiply the high bid and the low bid each by (1 - *t*), where *t* was Google Ads' target take rate of 14%, and submit the resulting products ("net bids") into AdX.

Bernanke and Bell

9. Project Bernanke was launched in November 2013. Bernanke is a Google Ads bidding optimization mechanism. Bernanke would seek to calculate bid multipliers to maximize total auction revenues while achieving Google Ads' target take rate. Bernanke increased the Google Ads high bid and decreased the Google Ads low bid submitted to the AdX auction. Bidding in this way increased the number of successful transactions, but Bernanke continued to target the same aggregate take rate as the pre-Bernanke bidding systems when it launched. Under the initial version of Bernanke, Google Ads targeted an average take rate on a per publisher basis. Bernanke did not change the manner in which the amount an advertiser paid Google Ads was determined.

10. Global Bernanke (also known as "Project Bell") was an update of Project Bernanke that launched in August 2015. Under Global Bernanke, Google Ads targeted an average take rate across all publishers, but allowed the target take rate to vary to an extent for individual publishers.

Bell v.2

11. Global Bernanke was subsequently updated in October 2016. This update, relating to the detection and management of multiple calls, was sometimes referred to internally as "Bell v.2." Under Bell v.2, Google Ads would modify its bidding behavior (to decrease bid variance) when receiving multiple calls for the same ad request to protect advertisers from the risk of price inflation.

12. A "call" refers to a publisher's request that an ad exchange supply an ad to show in response to a specific ad opportunity when a user has navigated to the publisher's property. Some publishers would call an ad exchange, such as AdX, multiple times for the same potential ad opportunity. For simplicity, I will refer to this practice as "multi-calling."

13. Some publishers employing multi-calls would set a different price floor for each of the multiple calls made from a single ad exchange for the same potential ad opportunity. For example, a publisher could configure an AdX call with a floor price of $5 for a potential ad opportunity and a second AdX call with a floor price of $4.50 for the same potential ad opportunity.

14. If not protected against, multi-calling can increase the prices that advertisers pay. If a buying tool has a high bid variance, calling that buying tool multiple times is more likely to yield a higher bid. For example, multi-calling a buying tool where the mean bid is $5 with a standard deviation of $0.10 is unlikely to result in the publisher receiving a bid materially above $5. Multi-calling a different buying tool where the mean bid is $5 with a standard deviation of $1 is more likely to yield a bid materially above $5. Bernanke increased the chances that Google Ads advertisers would overpay in the presence of publisher multi-calling because Bernanke increased Google Ads' bid variance, as it applied a multiplier (1 or higher) to the Google Ads high bid, while applying a separate multiplier (between 0 and 1) to the Google Ads low bid.

15. In addition, multi-calling can increase ad latency because it takes time each time the ad exchange is called, an auction is run, and the ad exchange returns an ad.

16. Bell v.2 changed Google Ads' bidding behavior only for the publishers that were understood, based on internal experiments, to be calling AdX multiple times for the same potential ad opportunity ("multi-calling publishers"). This launch did not directly change Google Ads' bidding behavior for any other publishers' ad opportunities. For example, Bell v.2 did not affect Google Ads bids on the inventory of publishers that called other exchanges before AdX, but did not call AdX multiple times, even if those other exchanges in turn called Google Ads.

17. Bell v.2 changed Google Ads' bidding behavior for multi-calling publishers as follows: (1) Google Ads disabled Bernanke when bidding on multi-calling publishers' inventory, (2) Google Ads set a limit on how high it would bid based on its bids from the prior week and also an absolute cap on how high it would bid, and (3) Google Ads would not buy inventory from multi-calling publishers via third-party exchanges.[2]

18. Disabling Bernanke on multi-call publishers protected Google Ads and its advertisers by reducing the variance of Google Ads bids (making it less likely for Google Ads to bid more on behalf of its advertisers than would have been needed to win a potential ad opportunity in the absence of multi-calling).

19. The cap on Google Ads bids reduced publishers' incentive to call AdX multiple times to obtain higher bids from Google Ads, thus protecting advertisers.

20. Limiting Google Ads bidding through third-party exchanges for multi-call publishers also mitigated against inflated prices for advertisers. If a publisher was calling AdX

[2] At the same time that Bell v.2 launched, Google also applied bid caps on exchanges that were detected to be not running second-price auctions.

multiple times, then it generally would further harm Google Ads advertisers also to bid on the same inventory from third-party exchanges.

21. To encourage them to reduce usage of multi-calls, Google communicated with multi-call publishers that Google Ads would be making some changes to how it submitted bids in response to multi-calling.

Alchemist

22. In September 2019, Google Ad Manager completed the transition from a "second price" auction system to a unified "first-price" auction system (i.e., the Unified First Price Auction) for the AdX auction. Google updated the Bernanke algorithms in 2019 to be compatible with the Unified First Price Auction. The updated version of Bernanke was sometimes referred to within Google as "Alchemist." The update was designed to [redacted].[3] Bernanke decides the "optimal bid" by maximizing advertiser surplus subject to a target take rate. Since Google has transitioned to a Unified First Price Auction, the amount an advertiser pays Google Ads has been determined in generally the same way as before the transition, except that Google Ads began to use minimum-bid-to-win data to determine the amount that the advertiser would need to bid to win the AdX auction (factoring in the Google Ads margin).

[3] [redacted].

23. [redacted] Today, Google Ads runs additional exploratory experiments to gather data to learn what level of bidding would maximize advertiser return.

Project Poirot

24. In a second-price auction, advertisers are incentivized to bid an amount equivalent to the actual value they place on an impression because they will only need to pay the amount of the second-highest bid if they win. In first-price auctions, winning advertisers have to pay what they bid, so they have an incentive to bid less than their true value to avoid paying more than they actually need to win. Because advertiser bidding strategies depend on the design of the auction, if an advertiser thinks it is bidding on a second-price auction but is actually bidding on a first-price auction, it will end up overpaying for an impression.

25. It was not always clear to advertisers (or Google) whether they were bidding into first or second-price auctions. Some exchanges were particularly non-transparent, presenting themselves as a second-price auction, while actually charging more than the second-highest bid, a practice that created incentives for buying tools to bid less than in a second-price auction. When faced with non-transparent auctions, advertisers would have to experiment with their bidding to develop optimal bidding strategies, which could be a challenging task for an individual advertiser

because of the volume of data and technical expertise needed to build statistically robust bidding strategies.

26. In July 2017, Google launched Project Poirot, an algorithm designed to protect DV360 advertisers from overbidding on exchanges that deviated from second-price auctions.

27. [redacted]

28. [redacted]

29. [redacted]

30. [redacted]

31. Poirot's process for calculating multipliers that maximized expected advertiser surplus did not take into account whether an ad exchange participated in header bidding.

32. Without an optimization like Poirot, DV360 would submit the advertiser's full bid to an ad exchange. Poirot only reduced ("shaded") advertisers' bids into ad exchanges. Poirot did not increase advertisers' bids into exchanges or the amounts that they paid for impressions.

33. Before Google transitioned to a Unified First Price Auction, Poirot determined that reducing bids into AdX did not increase expected advertiser surplus by more than the 10-percent threshold, so Poirot did not lower DV360 bids into AdX. Poirot also found that reducing bids into some other ad exchanges (such as Improve Digital and United) did not increase advertiser surplus by more than the 10-percent threshold, so Poirot did not lower DV360 bids into those exchanges either.

34. In the initial version of Poirot, an advertiser running multiple campaigns with different CPMs would have the same fixed bid multiplier for each campaign. In 2018, Google updated the underlying model in Poirot by introducing the ability to vary the bid multiplier based on the advertiser's bid (to further improve advertiser surplus). The updated model assigned advertiser's bids to "bid buckets." The "bid bucket" is one of five quantiles, assigned depending on the value of bids. The lower bid buckets are typically given a higher multiplier than higher bid buckets.

35. Poirot was also updated following Google's shift to a Unified First Price Auction. With the transition to a Unified First Price Auction, Google began providing minimum-bid-to-win data to buyers, and DV360 began to use that minimum-bid-to-win data to inform how Poirot would lower bids into AdX in order to optimize for expected advertiser surplus. Google subsequently updated Poirot to use models built from Google's minimum-bid-to-win data to optimize for expected advertiser surplus on other ad exchanges.

36. Since September 2017, Poirot has applied on AdX and on all third-party ad exchanges on which DV360 bids.[4] Poirot applied to exchanges running both first-price and second-price auctions because some exchanges might have been running both first-price and

[4] Poirot did not apply to AdX until September 2017.

second-price auctions (though not transparently). However, the Poirot optimization would not result in the bid changing for exchanges running only second-price auctions.

37. I understand that other buy-side tool providers (e.g., [redacted]) took steps to develop algorithms like Poirot that could determine when an advertiser should bid less than their true value for an impression.

I declare under penalty of perjury under the laws of the United States of America that the foregoing is true and correct.

Executed on August 5, 2023, in Chennai, India.

Nirmal Jayaram

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